

In the Claims

1. A chain for intended use in moving one or more articles in at least a conveying direction and also facilitating movement in a direction different from the conveying direction, comprising:

a plurality of modular links;

at least one article engaging assembly including a body supporting at least one rotatably mounted cap; and

a transverse connector connecting the modular links and rotatably supporting the body;

whereby the article engaging assembly may rotate to provide low backline pressure for the articles and facilitates article movement in the different direction through engagement with the rotatably mounted cap.

2. The chain of claim 1, wherein the article engaging assembly includes first and second rotatably mounted caps, each with a generally spherical outer surface.

3. The chain of claim 2, wherein the body includes first and second generally opposed supports for receiving and supporting the first and second caps, each support extending in a direction generally transverse to a longitudinal axis of the connector.

4. The chain of claim 3, wherein each cap includes a recess having a first portion adapted for receiving and holding an oversized portion of the corresponding support to capture the cap thereon.

5. The chain of claim 4, wherein the recess includes a second portion adapted for receiving a generally circular seating protrusion forming part of the support, whereby the seating protrusion forms a bearing surface for the cap.

6. The chain of claim 5, wherein the seating protrusion includes an outer surface having one or more indentations adapted for receiving a lubricant.

7. The chain of claim 1, wherein the cap includes at least one relief area adapted for receiving a lubricant.

8. The chain of claim 1, wherein the body includes a transverse channel for receiving the connector with sufficient clearance to permit free rotation, including when backline pressure is present.

9. The chain of claim 1, wherein a plurality of article engaging assemblies are rotatably supported by the transverse connector.

10. The chain of claim 1, wherein the plurality of links are arranged in first and second spaced apart rows, each row of links including a transverse connector rotatably supporting a plurality of article engaging assemblies.

11. The chain of claim 10, wherein the first and second rows are spaced in the conveying direction, and further including spacers supported by the connector associated with the first row of links such that the corresponding article engaging assemblies are laterally offset from the article engaging assemblies associated with the second row of links.

12. The chain of claim 11, wherein the spacers comprise rollers that project above a top edge of the modular links to prevent articles from catching thereon, including when backline pressure is present.

13. The chain of claim 1, wherein each link includes an apex having a slot for receiving the transverse connector passing through an adjacent link, whereby the slot permits side-flexing action to allow the chain to negotiate curves or bends, as well as longitudinal expansion and compression in the conveying direction.

14. A conveyor system including the chain of claim 1 and a drive unit for driving the chain in an endless path along a support structure.

15. A chain for intended use in conveying one or more articles in at least a conveying direction, comprising:

at least two modular links interconnected by a connector having a longitudinal axis oriented generally transverse to the conveying direction; and

at least one article engaging assembly, the assembly including a body rotatably mounted on the connector and supporting at least one cap having a generally spherical outer surface so as to permit rotation about an axis generally transverse to the longitudinal axis.

16. The chain of claim 15, wherein the article engaging assembly includes first and second caps, each having a generally spherical outer surface and mounted on first and second mounting posts extending from opposed sides of the body.

17. The chain of claim 16, wherein each cap includes a first portion adapted for receiving an oversized head portion of the corresponding mounting post in snap-fit engagement.

18. The chain of claim 17, wherein each cap includes a second portion adapted for receiving a seating protrusion forming part of the mounting post, the seating protrusion including an outer surface having at least one indentation adapted for receiving a lubricant.

19. The chain of claim 15, wherein the body includes a transverse channel having a longitudinal axis generally transverse to the conveying direction and parallel to the longitudinal axis of the connector.

20. The chain of claim 15, wherein a plurality of article engaging assemblies are rotatably supported by the transverse connector.

21. The chain of claim 15, wherein the plurality of links are arranged in spaced apart rows, each row of links including a transverse connector rotatably supporting a plurality of article engaging assemblies.

22. The chain of claim 21, wherein each link includes an apex having a slot for receiving the transverse connector passing through an adjacent link, whereby the slot permits both side-flexing action and longitudinal expansion and compression in the conveying direction.

23. A conveyor system including the chain of claim 15 and a drive unit for driving the chain in an endless path along a support structure.

24. A chain for intended use in situations where conveying an article in at least a conveying direction and a direction different from the conveying direction is desirable, comprising:

a plurality of modular links;

means for engaging the article, the engaging means capable of freely rotating in the conveying direction, including to allow for low backline pressure in an accumulation mode, and also facilitating article movement in the different direction; and

a connector extending generally transverse to the conveying direction for connecting the modular links to form the chain, the connector rotatably supporting the article engaging means.

25. The chain according to claim 24, wherein the means for engaging comprises a body including an elongated channel for receiving the connector so as to permit rotation of the body in the conveying direction and a pair of generally opposed supports, each receiving and rotatably supporting a cap having a rounded outer surface for engaging the article during conveyance in the different direction.

26. A chain for intended use in conveying one or more articles in at least a conveying direction, comprising:

a plurality of modular links arranged in spaced apart rows and interconnected by a connector having a longitudinal axis oriented generally transverse to the conveying direction;

a plurality of article engaging assemblies mounted on the connector for independent rotation, each assembly including a body having a pair of supports, each for supporting at least one cap so as to permit

independent rotation about an axis generally transverse to the longitudinal axis of the connector.

27. The chain according to claim 25, wherein the plurality of links include side links for guiding the chain, each side link including a depending arm, an inwardly extending transverse tab, and a receiver for receiving a locking element for retaining the connector.

28. The chain according to claim 25, wherein the rows are spaced in the conveying direction.

29. The chain according to claim 25, further including spacers supported by the connector associated with a first row of links such that the corresponding article engaging assemblies are laterally offset from the article engaging assemblies associated with a second row of links.

30. A chassis for rotatably supporting first and second caps and for intended use with a modular link conveyor chain for moving articles, comprising:

a body including a channel having a longitudinal axis and first and second generally opposed support shafts extending generally transverse to the longitudinal axis, each support shaft having a portion defining a lip for mating with the cap in snap-fit engagement.

31. The chassis according to claim 30, wherein the support shaft is cylindrical and stepped to form a bearing surface adapted for engaging with a corresponding surface formed in a second recess in the associated cap, the support shaft further including at least one indentation formed therein adapted for receiving a lubricant.

32. The chassis according to claim 30, wherein the body includes a generally circular seating surface adapted for matching with a corresponding surface of the associated cap, wherein a diameter of the circular seating surface generally matches a dimension of the corresponding surface of the associated cap.

33. The chassis according to claim 30, wherein the lip is created by an oversized portion of a head of the support.

34. A cap for intended use with a chassis rotatably supported by a connector interconnecting spaced apart links in a conveyor chain, comprising:

a body including a generally continuous spherical outer surface and an internal hub having a first recessed portion adapted for receiving an elongated support associated with the chassis and a second recessed portion for receiving and holding a portion of the support in snap-fit engagement.

35. The cap according to claim 34, further including at least one relief area adjacent the hub adapted for receiving a lubricant.

36. The cap according to claim 34, wherein the second recessed portion is generally circular.

37. A method of moving articles in a conveying direction, comprising:

interconnecting a plurality of modular links forming a first row with a transverse connector having a longitudinal axis to partially form a chain having a conveying surface;

rotatably mounting at least one article engaging assembly on the connector to form part of the conveying surface with the links, the assembly including at least one cap mounted for rotation about an axis generally transverse to the longitudinal axis,

whereby the conveying may be with low backline pressure in an accumulation mode and the rotatable caps enable smooth and efficient article movement in a direction different from the conveying direction.

38. The method according to claim 37, further comprising the step of mounting a first plurality of article engaging assemblies on the transverse connector of the first row of links.

39. The method according to claim 37, further comprising the steps of mounting a second plurality of article engaging assemblies on a second transverse connector associated with a second row of links and providing spacers on the second transverse connector such that the first plurality of article engaging assemblies are laterally offset from the second plurality of article engaging assemblies.

40. The method according to claim 37, further including the step of driving the chain in an endless path.